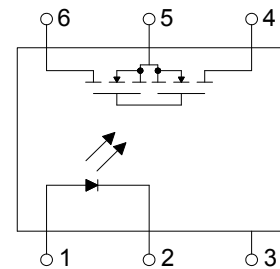


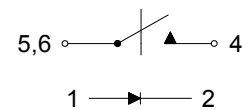
● Description

The NAQV216 series is robust, ideal for telecom and ground fault applications. It is a SPST normally open switch (1 Form A) that replaces electromechanical relays in many applications. It is constructed using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry and MOSFET switches.

● Schematic



1 FORM A
NORMALLY OPEN



● Features

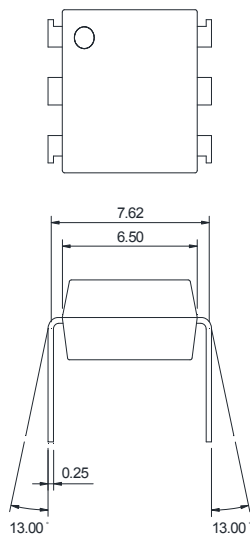
1. Normally Open, single pole single throw
2. Control 600V AC or DC voltage
3. Switch 120mA loads
4. Controls low-level analog signals
5. High sensitivity, low ON resistance
6. Low-level off-state leakage current
7. High isolation voltage 5KV (DIP / SMD)
8. Pb free and RoHS compliant
9. MSL class 1
10. Agency Approvals :
 - UL Approved (No. E169586): UL1577
 - c-UL Approved (No. E169586)
 - VDE Approved (No. 40020973): DIN EN60747-5-5

● Application

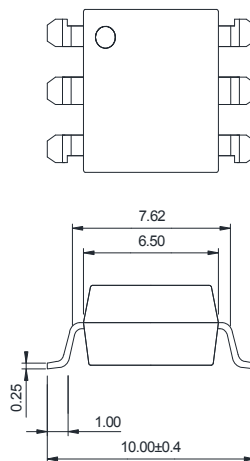
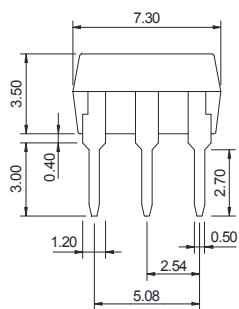
- Telecommunications (PC, electronic notepad)
- Modem
- Telephone equipment
- Security equipment
- Sensors
- Measuring and testing equipment
- Factory automation equipment
- High speed inspection machines

● Outside Dimension

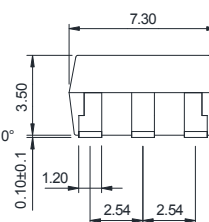
Unit : mm



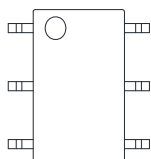
NAQV216



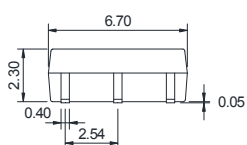
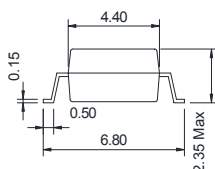
NAQV216A



3. Small outline for surface mount type.

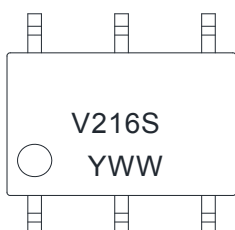
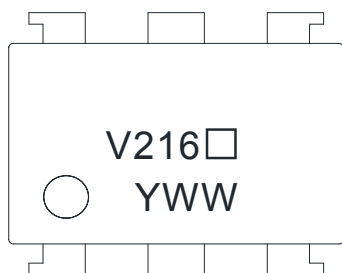


NAQV216S



TOLERANCE : $\pm 0.2\text{mm}$

● Device Marking



Notes :

V216□ □(Blank): DIP or SMD
V216S S : SOP
YWW Y : Year code / W : Week code

● Absolute Maximum Ratings

(Ta=25°C)

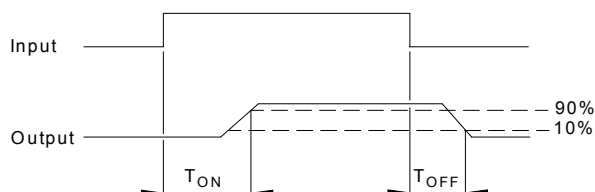
Item		Symbol	Rating	Unit
Input	Continuous forward current	I_F	50	mA
	Peak forward current	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Power dissipation	P_{in}	100	mW
	Derate linearly from 25°C	-	1.3	mW/°C
Output	Breakdown voltage	V_B	600	V
	Continuous load current	I_L	120	mA
	Power dissipation	P_{out}	500	mW
Isolation voltage		V_{iso}	NAQV216S	NAQV216
			1500Vrms	5000Vrms
Isolation resistance ($V_{io}=500V$)		R_{iso}	$\geq 10^{10}$	Ω
Total power dissipation		P_t	550	mW
Derate linearly from 25°C		-	2.5	mW/°C
Operating temperature		T_{opr}	-40 to +85	°C
Storage temperature		T_{stg}	-40 to +125	°C
Junction temperature		T_j	100	°C
Soldering temperature 10 seconds		T_{sot}	260	°C

● Electro-optical Characteristics

(Ta=25°C)

Parameter			Symbol	Conditions	Min.	Typ.	Max.	Unit
Input	Forward voltage		V _F	I _F =10mA	-	1.2	1.5	V
	Operation input current		I _{FON}	V _L =20V, I _L =100mA	-	-	3.0	mA
	Recovery input current		I _{FOFF}	V _L =20V, I _L ≤5μA	0.2	-	-	mA
Output	Breakdown voltage		V _B	I _B =50μA	600	-	-	V
	Off-state leakage current		I _{LEAK}	V _L =600V, I _F =0mA	-	0.2	1.0	μA
I/O capacitance			C _{iso}	V _B =0V, f=1MHz	-	6	-	pF
ON resistance	Connection	A	R _{ON}	I _F =10mA, I _L =100mA	-	35	80	Ω
		B			-	27	40	
		C			-	15	20	
Turn-on Time			T _{ON}	I _F =10mA, V _L =20V I _L =100mA, t=10ms	-	0.3	1.0	ms
Turn-off Time			T _{OFF}		-	0.1	1.5	ms

● Turn-on / Turn-off Time



● **Schematic and Wiring Diagrams**

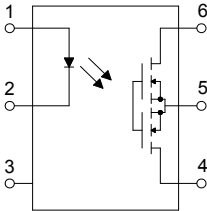
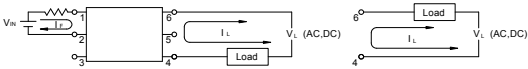
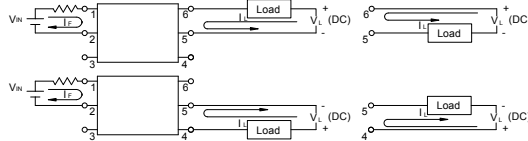
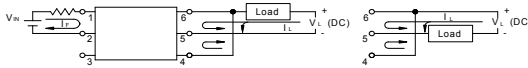
Schematic	Output Configuration	Load	Connection	Wiring Diagrams
	1a	AC DC	A	
		DC	B	
		DC	C	

Fig.1 Load Current vs. Ambient Temperature

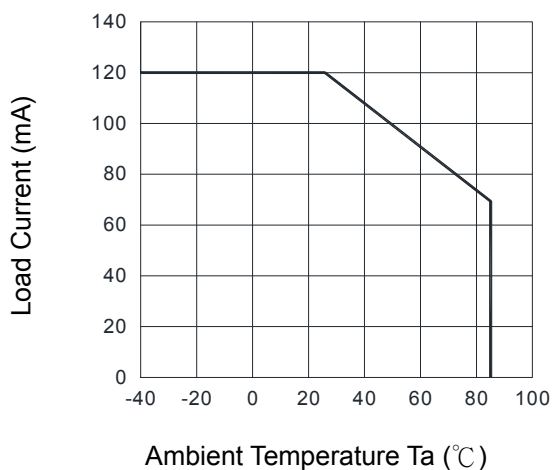


Fig.2 On Resistance vs. Ambient Temperature

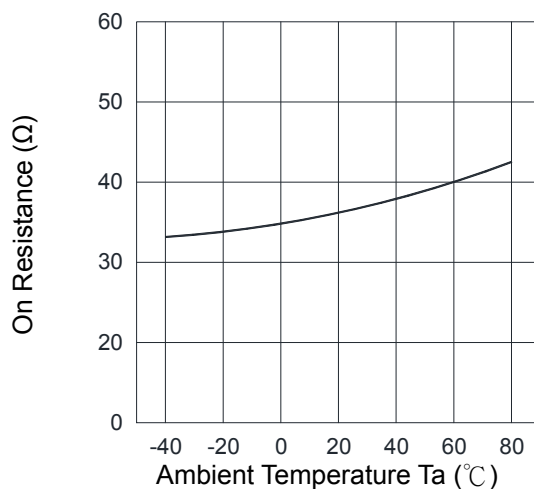


Fig.3 Turn-on Time vs. Ambient Temperature

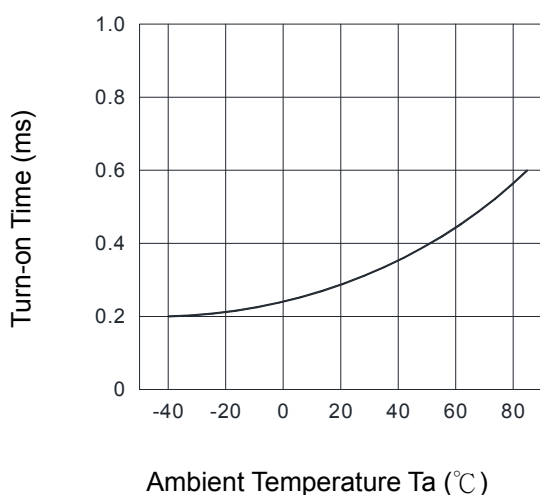


Fig.4 Turn-off Time vs. Ambient Temperature

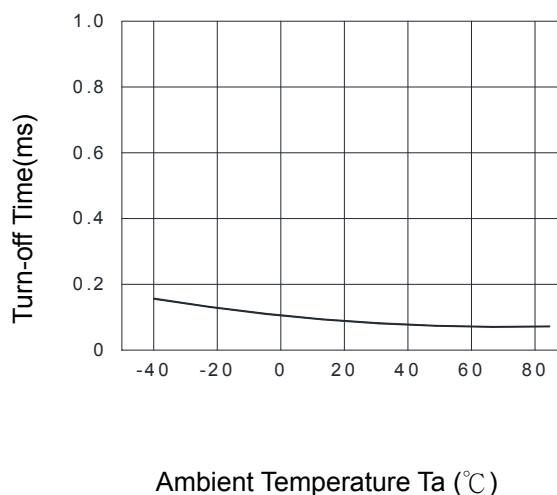


Fig.5 LED Operate Current vs. Ambient Temperature

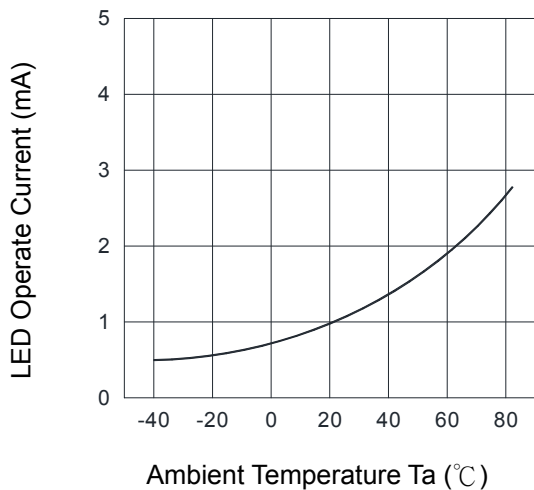


Fig.6 LED Turn-off Current vs. Ambient Temperature

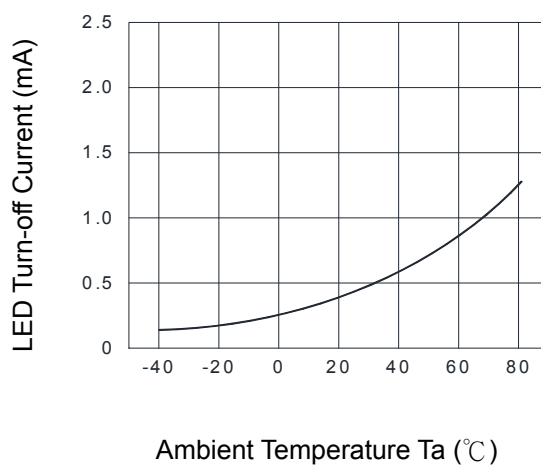


Fig.7 LED Dropout Voltage vs. Ambient Temperature

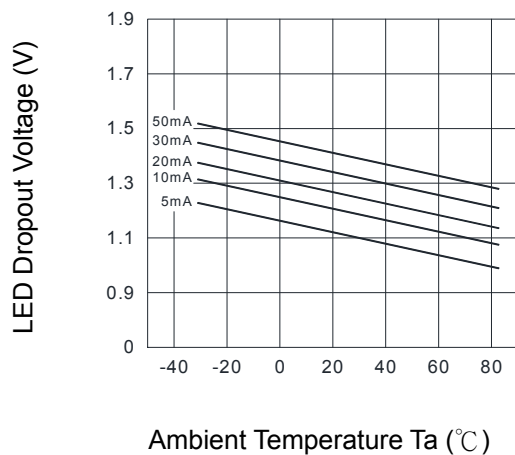


Fig.8 Voltage vs. Current Characteristics of Output at MOSFET Portion

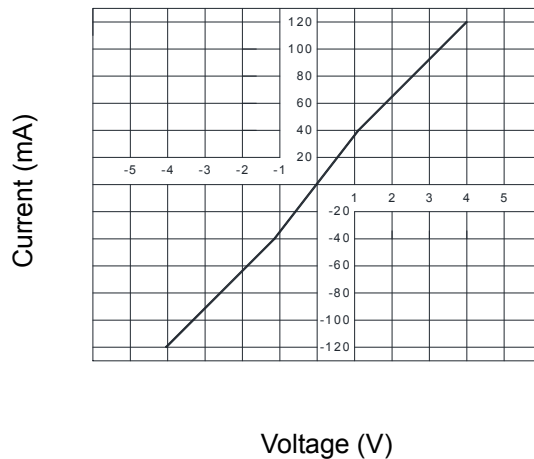


Fig.9 Turn-on Time vs. LED Forward Current

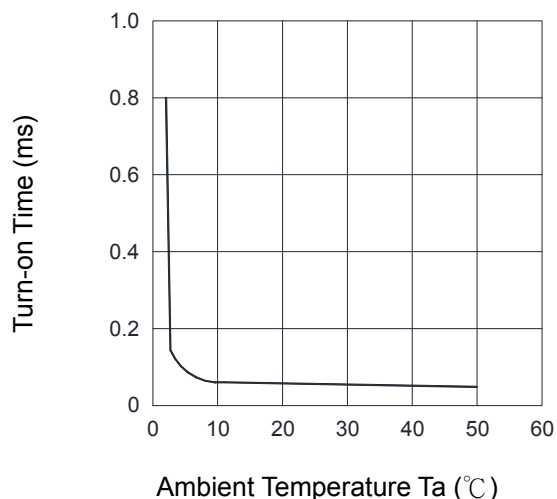


Fig.10 Off-state Leakage Current vs. Load Voltage

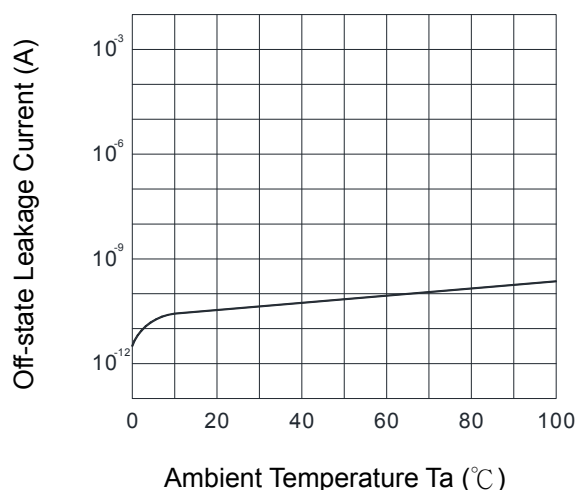


Fig.11 Turn-off Time vs. LED Forward Current

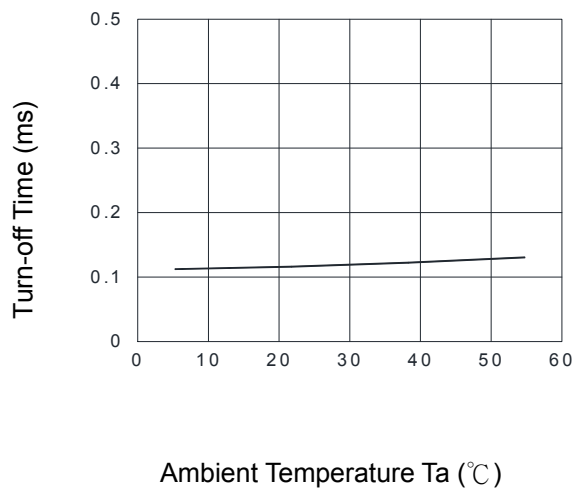
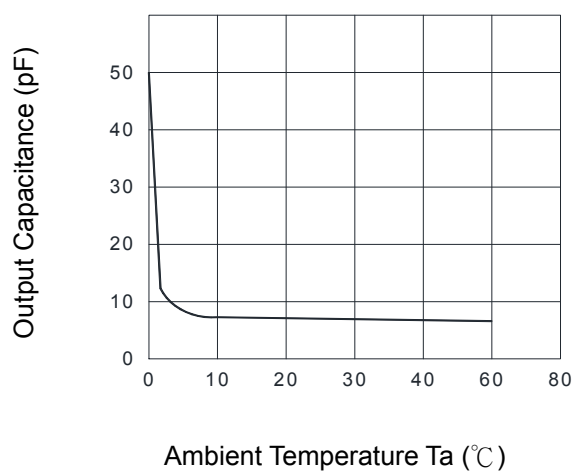
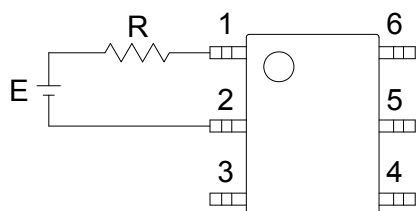


Fig.12 Output Capacitance vs. Applied Voltage



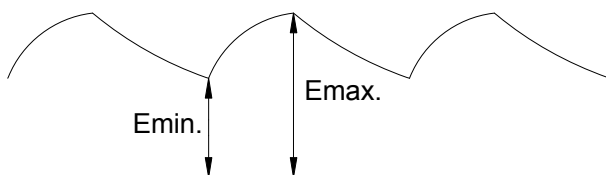
● Using Methods

Examples of resistance value to control LED forward current ($I_F=5\text{mA}$)

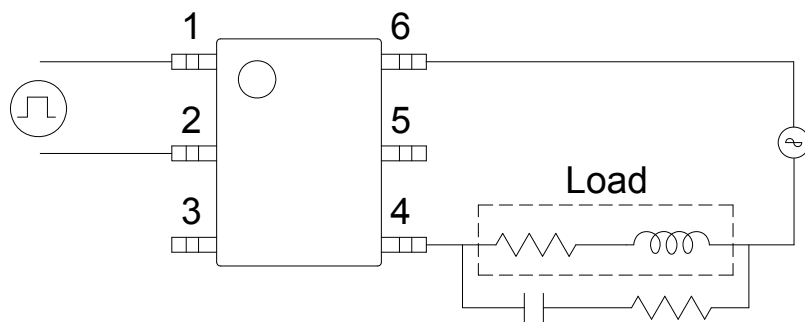
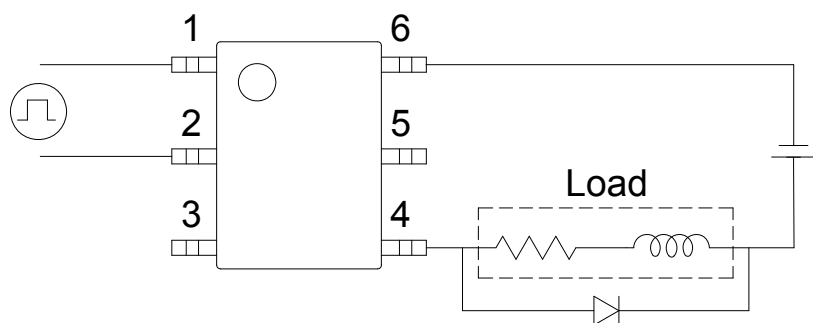


E	R
3.3V	Approx. 330 Ω
5V	Approx. 640 Ω
12V	Approx. 1.9K Ω
15V	Approx. 2.5K Ω
24V	Approx. 4.1K Ω

1. LED forward current must be more than 5mA , at E min.
2. LED forward current must be less than 50mA , at E max.



Regulate the spike voltage generated on the inductive load as follows :



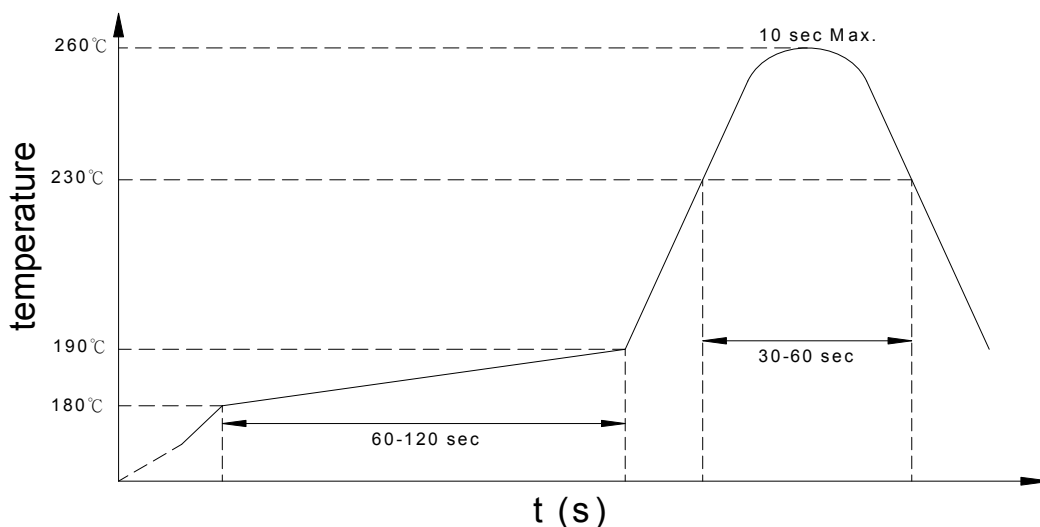
R-C Snubber

● **Recommended Soldering Conditions**

(a) Infrared reflow soldering :

- | | |
|--|---|
| ■ Peak reflow soldering : | 260°C or below (package surface temperature) |
| ■ Time of peak reflow temperature: | 10 sec |
| ■ Time of temperature higher than 230°C : | 30-60 sec |
| ■ Time to preheat temperature from 180~190°C : | 60-120 sec |
| ■ Number of reflows : | Two |
| ■ Flux : | Rosin flux containing small amount of chlorine
(The flux with a maximum chlorine content of 0.2 Wt% is recommended.) |

Recommended Temperature Profile of Infrared Reflow



(b) Wave soldering :

- | | |
|--------------------------|--|
| ■ Temperature : | 260°C or below (molten solder temperature) |
| ■ Time : | 10 seconds or less |
| ■ Preheating conditions: | 120°C or below (package surface temperature) |
| ■ Number of times : | One |
| ■ Flux : | Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.) |

(c) Cautions :

- | | |
|------------|--|
| ■ Fluxes : | Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent. |
| ■ | Avoid shorting between portion of frame and leads. |

● Numbering System

NAQV216 X (Y)

Note :

NAQV216 = Part No.

X = Lead form option (blank 、 S or A)

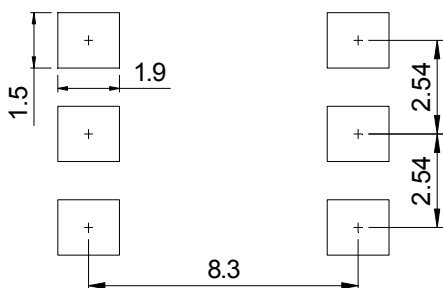
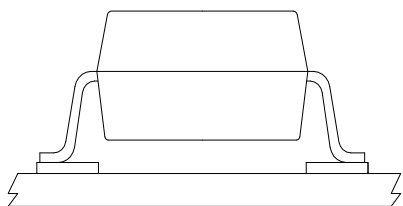
Y = Tape and reel option (TL 、 TR)

Option	Description	Packing quantity
A (TL)	surface mount type package + TL tape & reel option	1000 units per reel
A (TR)	surface mount type package + TR tape & reel option	1000 units per reel
S (TL)	small outline for surface mount type package + TL tape & reel option	2000 units per reel
S (TR)	small outline for surface mount type package + TR tape & reel option	2000 units per reel

● Recommended Pad Layout for Surface Mount Lead Form

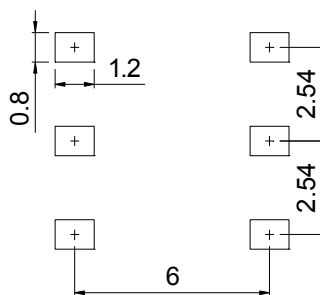
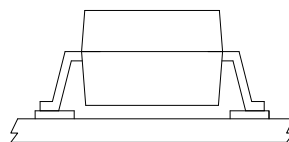
1. Surface mount type.

6-pin SMD



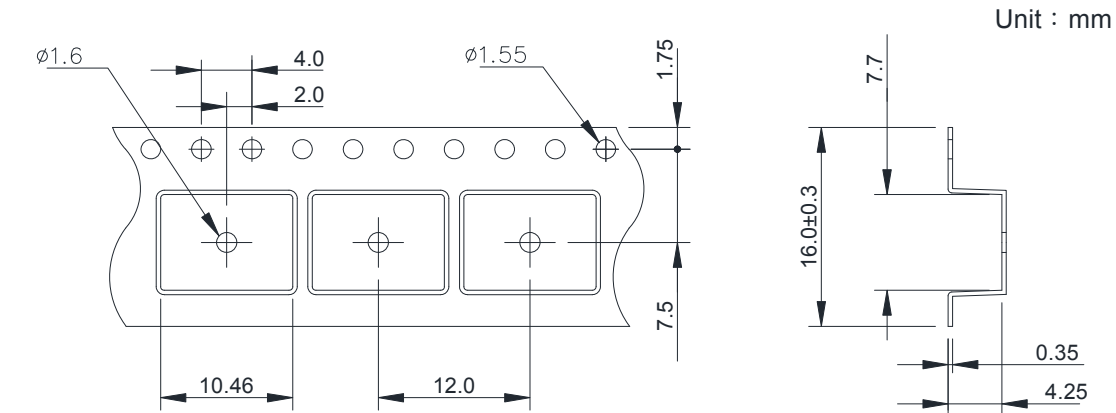
2. Small outline for surface mount type.

6-pin SOP

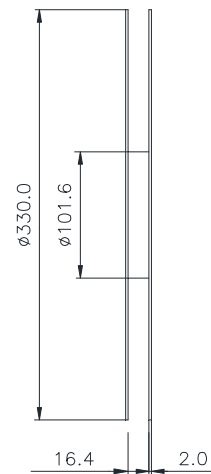
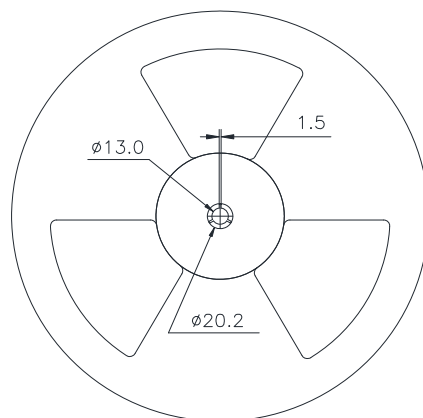
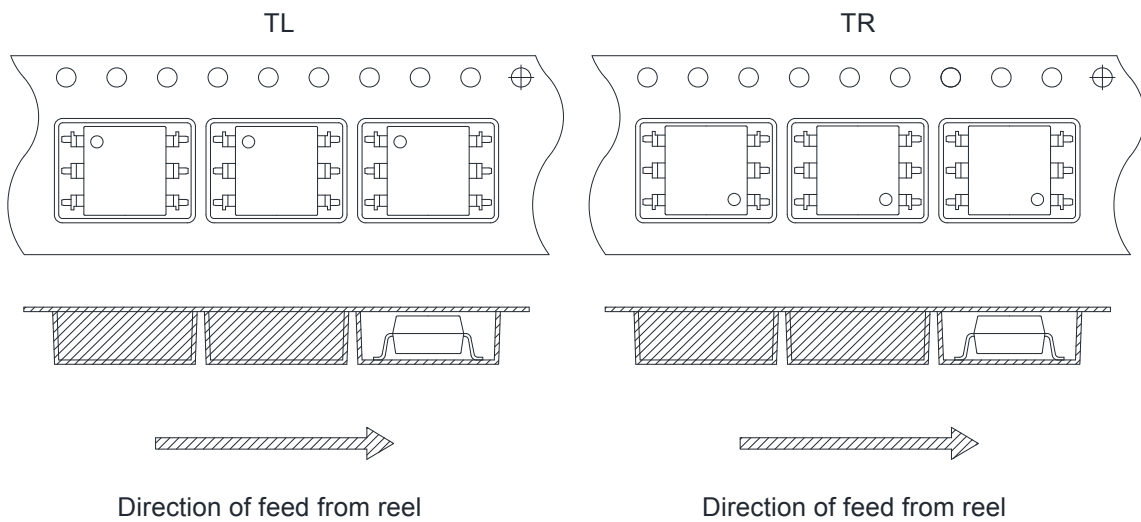


Unit : mm

● **6-pin SMD Carrier Tape & Reel**

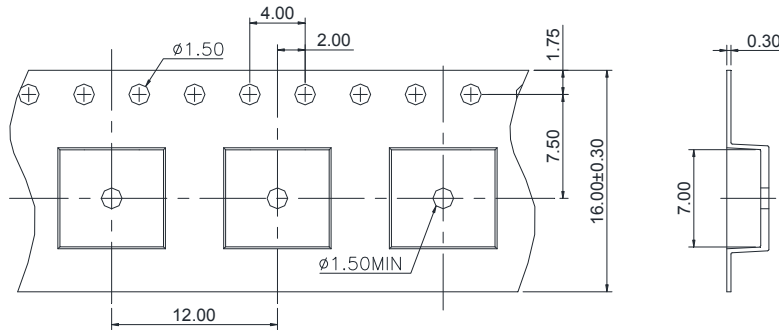


TOLERANCE : $\pm 0.2\text{mm}$



● **6-pin SOP Carrier Tape & Reel**

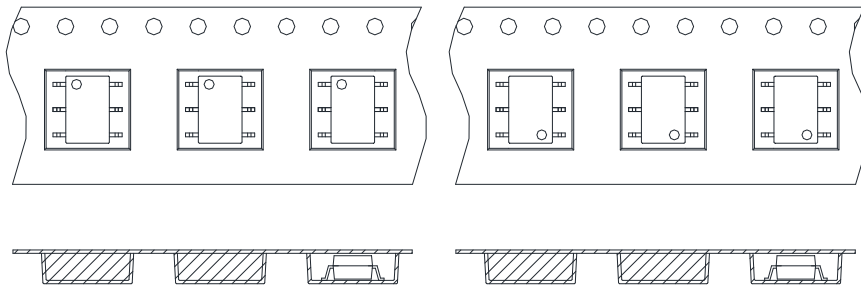
Unit : mm



TOLERANCE : $\pm 0.2\text{mm}$

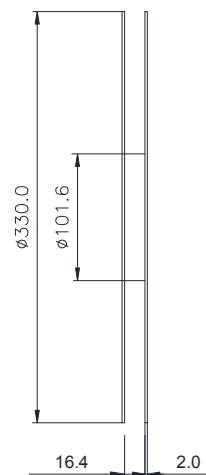
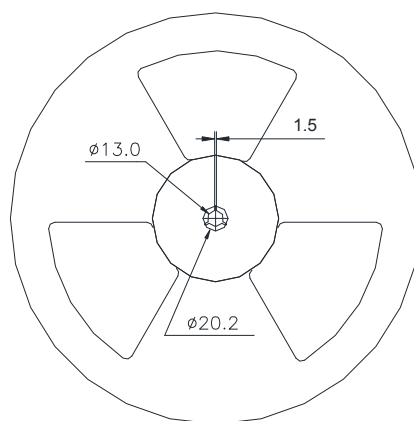
TL

TR



Direction of feed from reel

Direction of feed from reel



● **Application Notice**